

The interaction of 2-(5-methyl-2-phenyl-2h-1,2,3-diazaphosphol-4-yl)-4h-benzo[e]-1,3,2-dioxaphosphinin-4-one with activated carbonyl compounds. Synthesis of bis-heterocyclic systems containing di- and tetracoordinated phosphorus

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Abstract

© 2018 Taylor & Francis Group, LLC. The interaction of 2-(5-methyl-2-phenyl-2H-1,2,3-diazaphosphol-4-yl)-4H-benzo[e]-1,3,2-dioxaphosphinin-4-one with mesoxalic and trifluoropyruvic acids ethyl and diethyl esters, hexafluoroacetone and chloral proceeds with an exclusive participation of P(III) atom and allows to obtain 2-(5-methyl-2-phenyl-2H-1,2,3-diazaphosphol-4-yl)-derivatives of 1,4,2- and 1,3,2-dioxaphosphepines as well as dichlorovinylphosphonate, being the product of Perkow reaction in the case of chloral.

<http://dx.doi.org/10.1080/10426507.2017.1390459>

Keywords

benzodioxaphosphepine, benzodioxaphosphinine, chloral, Diazaphosphole, hexafluoroacetone, Perkow reaction

References

- [1] Corbridge, D. E. C., Phosphorus 2000. Chemistry, Biochemistry and Technology, 6th Ed.; CRC Press, Taylor & Francis Group, Boca Raton, London, New York, 2013; p. 1473.
- [2] Phosphorus-Carbon Heterocyclic Chemistry. The Rise of a New Domain. Ed. by F., Mathey. Elsevier Ltd., 2001; p. 846.
- [3] Quin, L., A Guide to Organophosphorus Chemistry; John Wiley & Sons, Chichester, Weinheim, Edinburg, Singapore, Toronto, 2000; p. 408.
- [4] Edmundson, R. S., Properties and reactions of phosphonic and phosphinic acids and their derivatives. In: Chemistry of Organophosphorus Compounds. Ed by F.R., Hartley; John Wiley & Sons, Chichester, New York, Brisbane, Toronto, Singapore, 1996; Vol. 4, pp. 495- 652.
- [5] Samota, M. K., Jhajharia, P., Seth, G., Heteroat. Chem. 2009, 20, 309- 315. doi: 10.1002/hc.20551.
- [6] Nicholson, J. W., Singh, G., Biomaterials 1996, 17, 2023- 2030. doi: 10.1016/0142-9612(96)00012-9.
- [7] Murugavel, R., Choudhury, A., Walawalkar, M. G., Pothiraja, R., Rao, C. N. R., Chem. Rev. 2008, 108, 3549- 3655. doi: 10.1021/cr000119q.
- [8] Romanenko, V. D., Kukhar, V. P., Chem. Rev. 2006, 106, 3868- 3935. doi: 10.1021/cr051000q.
- [9] Marinetti, A., Carmichael, D., Chem. Rev. 2002, 102, 201- 230. doi: 10.1021/cr990135r.
- [10] Mironov, V. F., Mavleev, R. A., Ofitserov, E. N., Sinyashina, T. N., Konovalova, I. V., Pudovik, A. N., Russ. Chem. Bull. Int. Ed. 1991, 40, 1488- 1490. doi: 10.1007/BF00961262.

- [11] Mironov, V. F.; Mavleev, R. A.; Burnaeva, L. A.; Konovalova, I. V.; Pudovik, A. N.; Chernov, P. P., *Russ. Chem. Bull. Int. Ed.* 1993, 42, 528- 530. doi: 10.1007/BF00698445.
- [12] Mironov, V. F.; Tsepaeva, O. V.; Enikeev, K. M.; Konovalov, A. I., *Russ. J. Gen. Chem.* 2000, 70, 484- 485.
- [13] Tsepaeva, O. V.; Mironov, V. F.; Enikeev, K. M.; Konovalov, A. I., *Russ. J. Gen. Chem.* 2000, 70, 482- 483.
- [14] Neda, I.; Plinta, H.J.; Fisher, A.; Jones, P.G.; Schmutzler, R., *J. Fluorine Chem.* 1995, 71, 65- 74. doi: 10.1016/0022-1139(94)03154-R.
- [15] Kaukorat, T.; Neda, I.; Thönessen, H.; Jones, P. Z., *Naturforsch.* 1996, 51b, 1501- 1510.
- [16] Neda, I.; Kaukorat, T.; Schmutzler, R.; Niemeyer, V.; Kutsher, B.; Pohe, I.; Engel, I., *Phosphorus, Sulfur Silicon Relat. Elem.* 2000, 162, 81- 218. doi: 10.1080/10426500008045221.
- [17] Jayashankar, B.; Lokanath, R. K. M.; Baskaran, N.; Sathish, H. S., *Eur. J. Med. Chem.* 2009, 44, 3898- 3902. doi: 10.1016/j.ejmech.2009.04.006.
- [18] Padmavathi, V.; Nagendra, M. A. V.; Mahesh, K.; Padmaja, A., *Chem. Pharm. Bull.* 2008, 56, 815- 820. doi: 10.1248/cpb.56.815.
- [19] Jayashankar, B.; Lokanatha, R. K. M., *Eur. J. Chem.* 2008, 5, 309- 315.
- [20] Jikyo, T.; Schatz, J.; Maas, G., *J. Phys. Org. Chem.* 2003, 16, 504- 512. doi: 10.1002/poc.625.
- [21] Bansal, R. K.; Gupta, N.; Kumawat, S. K., *Curr. Org. Chem.* 2007, 11, 33- 47. doi: 10.2174/138527207779316499.
- [22] Guo, X.; Feng, L.; Wang, Q.; Li, Z.; Tao, F. J., *Heteroat. Chem.* 2006, 43, 353- 359. doi: 10.1002/jhet.5570430215.
- [23] Arbuzov, B. A.; Dianova, E. N.; Galiaskarova, R. T., *Russ. Chem. Bull. Int. Ed.* 1987, 36, 1271- 1274. doi: 10.1007/BF00956678.
- [24] Mikoluk, M. D.; McDonald, R.; Cavell, R. G., *Inorg. Chem.* 1999, 38, 4056- 4063. doi: 10.1021/ic980622+.
- [25] Bansal, R. K.; Heinicke, J., *Chem. Rev.* 2001, 101, 3549- 3578. doi: 10.1021/cr000434c.
- [26] Bansal, R. K.; Gupta, N.; Gupta, N., *Heteroat. Chem.* 2004, 15, 271- 287. doi: 10.1002/hc.20002.
- [27] *Phosphorous Heterocycles I.* Ed by R. R., Gupta; Springer-Verlag, Berlin, Heidelberg; Top. Heterocycl. Chem. 2009, Vol. 20, p. 314.
- [28] Schöller, W. W.; Niecke, E., *J. Chem. Soc. Chem. Comm.* 1982, 11, 569- 570. doi: 10.1039/C39820000569.
- [29] Bansal, R. K.; Gupta, N.; Kumawat, S. K., *Curr. Org. Chem.* 2007, 11, 33- 47. doi: 10.2174/138527207779316499.
- [30] Khusainova, N. G.; Garipova, G. R.; Zyblikova, T. A.; Cherkasov, R. A., *Russ. J. Gen. Chem.* 2002, 72, 323. doi: 10.1023/A:1015414827539.
- [31] Khusainova, N. G.; Mostovaya, O. A.; Azancheev, N. M.; Litvinov, I. A.; Krivolapov, D. B.; Cherkasov, R. A., *Mendeleev Commun.* 2004, 14, 212- 214. doi: 10.1070/MC2004v014n05ABEH001926.
- [32] Mikoluk, M. D.; Gavell, R. G., *Inorg. Chem.* 1999, 38, 1971- 1978. doi: 10.1021/ic9802092.
- [33] Mikoluk, M. D.; McDonald, R.; Gavell, R. G., *Inorg. Chem.* 1999, 38, 2791- 2801. doi: 10.1021/ic9802101.
- [34] Weinmaier, J. H.; Brunnhuber, G.; Schmidpeter, A., *Chem. Ber.* 1980, 113, 2278- 2290. doi: 10.1002/cber.19801130621.
- [35] Schmidpeter, A.; Karaghiosoff, K., *Multiple Bonds and Low Coordination in Phosphorus Chemistry.* Georg Thieme, Stuttgart, 1990, p. 496.
- [36] Mironov, V. F.; Litvinov, I. A.; Gubaidullin, A. T.; Aminova, R. M.; Burnaeva, L. M.; Azancheev, N. M.; Filatov, M. E.; Konovalova, I. V., *Russ. J. Gen. Chem.* 1998, 68, 1027- 1042.
- [37] Mironov, V. F.; Konovalova I. V.; Mavleev R. A.; Mukhtarov A. S.; Ofitserov E. N.; Pudovik A. N., *Russ. J. Gen. Chem.* 1991, 61, 1997- 2001.
- [38] Savostina, L. I.; Aminova, R. M.; Mironov, V. F., *Russ. J. Gen. Chem.* 2006, 76, 1031- 1040. doi: 10.1134/S107036320607005X.
- [39] Schöller, W.; Niecke, E., *J. Chem. Soc. Chem. Commun.* 1982, 11, 569- 570. doi: 10.1039/C39820000569.
- [40] Zverev, V. V.; Mironova, O. Y.; Bazhanova, Z. G.; Mironov, V. F., *Zh. Obshch. Khim. (Russ. J. Gen. Chem.)*. 1993, 11, 2573- 2584.
- [41] Mironov, V. F.; Burnaeva, L. A.; Konovalova, I. V.; Chlopushina, G. A.; Mavleev, R. A.; Chernov, P. P.; Pudovik, A. N., *Russ. J. Gen. Chem.* 1993, 63, 17- 21.
- [42] Konovalova, I. V.; Burnaeva, L. A.; Mironov, V. F.; Chlopushina, G. A.; Pudovik, A. N., *Russ. J. Gen. Chem.* 1994, 64, 57- 61.
- [43] Mironov, V. F.; Gubaidullin, A. T.; Konovalova, I. V.; Ivkova, G. A.; Litvinov, I. A.; Burnaeva, L. M.; Zyblikova, T. A.; Romanov, S. V.; Mavleev, R. A., *Russ. J. Gen. Chem.* 2000, 70, 1707- 1726.
- [44] Mironov, V. F.; Ivkova, G. A.; Abdrakhmanova, L. M.; Mironova, E. V.; Krivolapova, D. B.; Konovalova, I. V., *Mendeleev Comm.* 2011, 21, 282- 284. doi: 10.1016/j.mencom.2011.09.018.

- [45] Sheldrick, G. M., SADABS, 1997, Bruker AXS Inc., Madison, WI-53719, USA.
- [46] Sheldrick, G. M., SHELX-97. Programs for crystal structure analysis (Release 97-2)–Germany: University of Gottingen. 1997. Vol. 1, 2.
- [47] Farrugia, L. J., J. Appl. Cryst. 1999, 32, 837- 838. doi: 10.1107/S0021889899006020.
- [48] APEX2 (Version 2.1), SAINTPlus. Data Reduction and Correction Program Version 7.31A, Bruker Advanced X-ray Solutions, BrukerAXS Inc., Madison, Wisconsin, USA, 2006.
- [49] Spek, A. L., Acta Crystallogr. Sec. A. 1990, 46, 34- 41.
- [50] Farrugia, L. J., J. Appl. Cryst. 1997, 30, 565- 566. doi: 10.1107/S0021889897003117.